



*Center for Excellence in
Nuclear Technology, Engineering, and Research*

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To whom it may concern:

Enclosed is the annual operating report for the University of Utah TRIGA Nuclear Reactor, License No. R-126, Docket number 50-407, for the period of 1 July 2006 through 30 June 2007. This report fulfills the requirements of the TRIGA technical specifications (TTS) 6.10(5).

If there are any further questions or concerns regarding this report, please contact me at (801) 581-4188

Respectfully,

Melinda P. Krahenbuhl
Reactor Administrator

A020

NRR

**The University of Utah TRIGA Reactor
Annual Operating Report
for the period
1 July 2006 through 30 June 2007**

A. NARRATIVE

1. Operating Experience

The University of Utah Center for Excellence in Nuclear Technology, Engineering, and Research (CENTER) TRIGA Reactor, License No. R-126, Docket No. 50-407, was critical 52.463 hours and generated 1289.236 kilowatt-hours of thermal energy during this reporting year. The reactor was used for educational demonstrations, laboratory experiments, systems tests, power measurements and sample irradiations.

2. Changes in Facility Design

The documents supporting a forthcoming upgrade in licensed power from 100 kW to 250 kW are being reviewed by the NRC. No facilities changes have occurred.

3. Surveillance Tests

Documentation of all surveillance activities is retained and stored by the facility.

a. Control Rod Worth

Table 1.
Summary of control rod worth, SDM, and ER

Core Configuration	#24-B	#24-B	#24-B
Date	8/25/06	11/08/06	2/22/07
	Worth (\$)	Worth (\$)	Worth (\$)
Safety Rod	2.017	2.120	2.173
Shim Rod	1.463	1.503	1.547
Regulating Rod	0.270	0.263	0.273
Excess Reactivity	0.751	0.771	0.787
Shutdown Margin	0.983	0.996	1.033

b. Control Rod Inspection

The Biennial Control Rod Inspection was performed during December 2005. The control rods were sequentially removed from the reactor core for visual inspection. Each control rod was found to be in good condition with no noticeable deterioration or corrosion having occurred since the last inspection. Rod drop times were measured on 8/25/06, 11/08/06, and 2/22/07. All rod drop times were less than 1.0 seconds.

c. Reactor Power Level Instrumentation

Calorimetric power calibrations were performed on 8/29/06, and 2/23/07 with the following results:

Date	Measured % Power	Calculated Power Level
8/29/06	91.8	86.7
2/23/07	92.0	91.9

d. Fuel Inspection

The Biennial Fuel Inspection was performed during December 2005. Each fuel element was visually inspected while keeping it submerged for shielding. No deterioration or excessive corrosion of in-core fuel elements was observed since the previous inspection. Pool water is sampled and analyzed periodically for evidence of fission product activity indicative of defective or deteriorating fuel. Analyses of pool water following full-power reactor operations lasting several hours have not shown any indication of fission product leakage.

e. Fuel Temperature Calibration

Fuel temperature circuits were calibrated on 8/24/06 and 2/28/07. The circuits were calibrated to less than a 2°C error over the range 20°C to 400°C.

f. Reactor Safety Committee Audits

Four Audits were completed during this period.

Table 2.
Audit Summary

Audit	Period	auditor
Operation and Maintenance	1 Jan. 2006 to 30 Jun. 2006	David M. Slaughter
Radiation Safety and ALARA	1 Jan. 2006 to 30 Jun. 2006	David M. Slaughter
Operation and Maintenance	1 Jul. 2006 to 31 Dec. 2006	David M. Slaughter
Radiation Safety and ALARA	1 Jul. 2006 to 31 Dec. 2006	Rian B. Smith

No significant deviations from normal operating practices were identified by these audits.

g. Environmental Surveys

Six environmental monitors are located in areas surrounding the CENTER. Rian B. Smith reported to the RSC a maximum exposure of 47 millirem per quarter to an environmental dosimeter located at building #80. Table 3 contains the average dose recorded for four prior years.

Table 3.
Summary of environmental monitoring

Year	Average quarterly readings for the 6 environmental monitors (mrem)
2006	36.74
2005	37.53
2004	35.58
2003	36.00

B. ENERGY OUTPUT

The reactor was critical for 52.463 hours and produced 0.054 megawatt-days (1289.236 kilowatt-hours) of energy during this reporting period. Since initial criticality, the reactor has been operated for a total of 3314.551 hours with an accumulated total energy output of 8.434 megawatt-days (202410.162 kilowatt-hours).

C. EMERGENCY SHUTDOWNS AND INADVERTENT SCRAMS:

Table 4.
Summary of Inadvertent SCRAMS

Date	Run Number	Type	Cause	Action
7/07/06	1527	Linear Power	High voltage power interrupt	N/A
9/21/06	1536	Linear Power	High voltage power interrupt	N/A
10/27/06	1546	Linear Power	Feedback from the reactor power switch	N/A
11/10/06	1552	Linear Power	Feedback from the reactor power switch	N/A
12/01/06	1564	Linear Power	Feedback from the reactor power switch	N/A
4/04/07	1576	Linear Power	Feedback from the reactor power switch	N/A

There were 6 inadvertent SCRAMs occurred during this period (during NRC SRO training sessions). There were no emergency shutdowns. Summary of the inadvertent scrams are in Table 4.

D. MAJOR MAINTENANCE

- 1) New flow meter was installed.
- 2) PI (Pneumatic Irradiator) was re-installed
- 3) Concrete cap on the top of the reactor tank was removed and two 0.75" rubber mats were installed.

E. CHANGES, TESTS AND EXPERIMENTS PURSUANT TO 10 CFR 50.59

As of the end of the reporting period, the current membership of the Reactor Safety Committee (RSC) as designated by the Licensee is as follows:

James M. Byrne, Chair
David M. Slaughter
Karen Langely, RSO of University of Utah
Melinda P. Krahenbuhl, Reactor Administrator
Dongok Choe, Reactor Supervisor
Gary M. Sandquist
Robert J. Huber
James Thompson
Rian B. Smith

The CENTER staff continues to review and update facility documentation to assure compliance with all applicable regulations.

F. RADIOACTIVE EFFLUENTS

1. Liquid Waste - Total Activity Released: none

2. Gaseous Waste - Total Estimated Activity Released: 14.338 μCi

The TRIGA Reactor was operated for 52.463 hours at power levels up to approximately 90 kW. At this power level argon-41 production is substantially below MPC values for unrestricted areas. The minimum detectable concentration of Ar-41 for the stack monitor has been found to be one-third of 10 CFR 20 appendix B limits for release to unrestricted areas. The average annual calculated concentration of Ar-41 generated during operations is estimated at $6.835\text{E-}11 \mu\text{Ci/ml}$ approximately 0.002 % of the DAC for this radionuclide. The total amount of Ar-41 released was estimated at 14.338 μCi . No phosphorus-32 was released from CENTER during this period. The total amount of all gaseous radioactivity released was estimated at 14.338 μCi . A monthly summary of gaseous releases is given in Table 5.

Table 5.
Summary of Monthly Gaseous Radioactive Effluent

Month	Ar-41 (μCi)	Estimated Release P-32 and all others	Total (μCi)
July	0.397	0	0.397
August	3.028	0	3.028
September	0.949	0	0.949
October	1.382	0	1.382
November	4.194	0	4.194
December	0.518	0	0.518
January	0.129	0	0.129
February	3.412	0	3.412
March	0.330	0	0.330
April	0.000	0	0.000
May	0.000	0	0.000
June	0.000	0	0.000

Total Activity of gaseous effluent: 14.338 μCi

3. Solid Waste - Total Activity: None

No solid waste material was sent to the Radiological Health Department for disposal during the period of 1 July 2006 through 30 June 2007.

G. RADIATION EXPOSURES

Personnel with duties in the reactor laboratory on either a regular or occasional basis have been issued an OSL dosimeter by the University of Utah Radiological Health Department. The duty category and monitoring period of personnel are summarized in Table 6.

Table 6.
Summary of Monitored Personnel

Name	Monitoring Period	Duty Category
Jesse Reeves	7/01/06-6/30/07	Regular
Melinda Krahenbuhl	7/01/06-6/30/07	Regular
Dong-ok Choe	7/01/06-6/30/07	Regular
Brian A. Harper	7/01/06-6/30/07	Regular
Douglas Crawford	7/01/06-6/30/07	Regular
John D. Bess	7/01/06-6/30/07	Regular
Ward Chapman	7/01/06-6/30/07	Regular
Jorge Navarro	7/01/06-6/30/07	Regular
Christy Seiger Webster	7/01/06-21/31/06	Regular/Terminated
Sang Kyu Lee	7/01/06-6/30/07	Regular/Terminated
Roger Carrasquel	7/01/06-8/31/06	Regular/Terminated
Nathan Brown	7/01/06-6/30/07	Regular
Brandalyn Bassett	9/01/06-6/30/07	Regular
Jeff Davis	11/01/06-6/30/07	Regular
Michael A Summer	11/01/06-6/30/07	Regular/Terminated
James A Gawenis	11/01/06-12/31/06	Regular/Terminated
Margaret Fitch	4/01/07-6/30/07	Regular
Jeniffer Davis	4/01/07-6/30/07	Regular
Randall W Morrill	6/01/07-6/30/07	Regular
David M Slaughter	12/01/06-6/30/07	Regular

Measured Doses

7/1/06-6/30/07 Doses: <5 mrem average; 5 mrem highest measured

Dose Equivalent Limit

Maximum Permissible Dose Equivalent = 5000 mrem/year (1250/quarter).

Minimum Detectable Dose per Monthly Badge = 10 mrem.

Five hundred and nine (509) individuals visited the reactor facility during the period 1 July 2006 to 30 June 2007. None of the visitors received a measurable dose. A summary of whole body exposures to CENTER personnel is presented in Table 7.

Table 7.
Summary of Whole Body Exposures

Estimated whole body exposure range (rem):	Number of individuals in each range:
No Measurable Dose (Less than 0.10)	20
0.10 to 0.25	0
0.25 to 0.50	0
0.50 to 0.75	0
0.75 to 1.00	0
1.00 to 2.00	0
2.00 to 3.00	0
3.00 to 4.00	0
4.00 to 5.00	0
Greater than 5 rem	0

H. LABORATORY SURVEYS

Monthly surveys of the facility were conducted by the University of Utah Radiological Health Department during the reporting period. The surveys have not indicated any unusual radiation levels over previous years. Records of surveys are retained by the facility.

I. ENVIRONMENTAL STUDIES

Environmental monitoring conducted by the University of Utah Radiological Health Department indicated no unusual dose rates in the areas surrounding the Merrill Engineering Building, which houses the reactor facility.

Prepared by: *C. Hansen* Date: 7/2/2007

Submitted by: *C. Hansen* Date: 7/2/2007
Reactor Supervisor

Approved by: *John Smith* Date: 7/2/2007
Reactor Administrator